Nuclear Experimental Group II(Annual Report)

journal or publication title	The science reports of the Tohoku University. Ser. 8, Physics and astronomy
volume	12
number	1
page range	29-31
year	1991-07-25
URL	http://hdl.handle.net/10097/25731

Nuclear Experimental Group II

Academic Staff

Professors	Tsutomu Tohei, Manabu Fujioka* and Ken Abe**
Associate Professor	Shogo Hayashibe
Research Physicists	Nobuaki Kawamura, Eiji Tanaka and Kosuke Kageyama

Secretary	(Hiroko Abe)
Graduate Students	Michiharu Wada (D3), Mineichi Kakiuchi (M2) and Masaru Ohya (M1)

*Cyclotron and Radioisotope Center
**College of General Education

Research Activities

a. Nuclear g-factor and Half-lives of the 3485 and 3925 keV Isomers in ^{142}Nd (*N. Kawamura, E. Tanaka, M. Kakiuchi, T. Ohya, I. Higashino, M. Kanazawa, S. Hayashibe and M. Fujioka*)

Nuclear g-factors of the 3485 keV, 9^- and 3925 keV, 10^+ isomers in ^{142}Nd have been measured using the time integral perturbed angular distribution (TIPAD) method for in-beam γ-rays. The isomers were excited through the ^{142}Ce(α,4n)^{142}Nd reaction at fields of +1.8 and -1.8T. We have deduced the g-factors of 1.05(13) and 0.79(24) for the 3485 and 3925 keV states respectively using half-lives reported by Prade et al. In order to obtain more accurate values, an experiment on the half-life measurement is also progressing.

b. Characteristics of a Very Thin Proportional Counter with Rectangular Cross Section (*K. Kageyama, S. Hayashibe, M. Kanazawa, H. Watanabe* and M. Fujioka,* *Electrotechnical Laboratory)

The pulse-height variation effect observed for ^{241}Am α-rays with a 3 mm thick counter using an argon-methane gas mixture at atmospheric pressure was investigated by a computer simulation. The results showed that this effect came from the space-charge effect on gas gain, depending on the collection time spread of electrons from the initial ionization track.

The practical ratio of the vertical width to the thickness of a thin counter was found to be about 5, by estimating the electric field strength at an incident distance from the anode, where the columnar recombination was observed to occur.

c. Study on the Charge Distribution of Fission Products in Proton-induced Fission of ^{238}U (*M. Fujioka, T. Shinozuka*, H. Sunaoshi, Y. Fukashiro, M. Furukawa and H. Kudo***, *Cyclotron Radioisotope Center, **Dept. of Chemi., Niigata University)

The charge distribution of fission products in the proton-induced fission of ^{238}U was studied by the use of Ion Guide Isotope Separator on-line (IGISOL). The most probable charge and the width of the charge distribution were precisely investigated in connection with mass chains.

d. Isomeric Yield Ratios of Fission Products in Low Energy Fission of Actinides (*M. Fujioka, T. Shinozuka,H. Sunaoshi, Y. Fukashiro, M. Furukawa and H. Kudo**, *Dept. of Chemi., Niigata University)

Isomeric yield ratios of fission productswere measured by IGISOL. About 30 isomer ratios were obtained inthe proton-inducedfission of ^{238}U. As for the system ofthe proton-induced fission of ^{232}Th, experiments is in progress.

e. Measurement of the Mass of the Electron Neutrino using Electron Capture of ^{163}Ho (*M. Fujioka, S. Yasumi* et al.*, *Teikyo University/KEK)

Fluorescence spectra of x-rays of Dy were measured for several incident energies at the Photon Factory of KEK. The results disagreed with the Livermore one.

f. Development of Ion-trapping for Nuclear Laser-Microwave Spectroscopy (*M. Fujioka, S. Hayashibe, T. Shinozuka, H. Sunaoshi, Y. Fuhashiro, M. Furukawa and M. Wada**, *INS, University of Tokyo)

Hyperfine structure of $^{87}Sr^{+}$ stored in an RF trap has been studied and the hyperfine constant is obtained 30 times more accurately than previously.

g. A Personal Computer Program for Analysis of Experimental Data in Nuclear Physics (*N. Kawamura, M. Yoshioka* and I. Higashino*, *Laboratory of Nuclear Science)

A handy program to analyze experimental data of nuclear spectroscopy has been developed. The program, which is written in C-language and runs on PC-9801 and compatibles, can read the raw data from the magnetic-tape drive connected by GPIB and be used for data reduction and analysis: conversion of multiparameter data of the list mode to projection spectra, fitting by the method of least squares, graphical output on a laser-beam printer etc.

h. Study of the Giant Resonance in ^{12}C via the (e,e'n) Coincidence Experiment (II) (*K. Takahisa, T. Saito, S. Suzuki, T. Tohei, T. Nakagawa, Y. Kobayashi and K. Abe*)

Improvement of (e,e'n) coincidence measuring system revealed the ground-state-transition neutrons in coincidence with e' from θ=0° to 350°. The angular distributions agree partly with RPA calculations by Cavinato et al.

i. The Study of the Giant Resonance in ^{40}Ca(e,e'n) Reaction (I) (*C. Takakuwa, T. Saito, S. Suzuki, K. Takahisa, T. Tohei, T. Nakagawa and K. Abe*)

The detection efficiency of the (e,e'n) coincidence measuring system was determined by means of ^{252}Cf sources and TOTEFF code used in CYRIC. The energy distributions were measured in terms of missing energy spectra.

j. Low-spin States of ^{140}Ce (*M. Kanazawa, S. Hayashibe, A. Furusawa*, M. Fujioka and M. Wada*, *Niigata University)

The states of ^{140}Ce(N=82) have been studied through the chain beta-decay of ^{140}Nd(^{140}Nd(3.3, E.C.)^{140}Pr(3.4 min, β^{+})^{140}Ce). A source of ^{140}Nd was obtained by the reaction, ^{142}Nd(γ,2n)^{140}Nd, using 60-MeV bremsstrahlung. The gamma-gamma angular correlation was measured by two Ge(Li) detectors and one NAI(Tl) detector. The data analysis is in grogress.

Publications

1. Measurement of the Mass of the Electron Neutrino Using Electron Capture in ^{163}Ho, S. Yasumi, H. Maezawa, S. Kishimoto, M. Fujioka, K. Sera, T. Omori, K. Shima, T. Mukoyama, Y. Inagaki and G. Izawa, *Nucl. Phys. (Proc. Suppl.)* **B16** (1990) 499.

2. A Fast Data Acquisition System for In-beam Nuclear Spectroscopy, M. Wada, T. Saito, H. Sunaoshi, N. Kawamura, S. Hayashibe, T. Ishimatsu, T. Shinozuka and M. Fujioka, *Nucl. Instr. and Methods Phys. Research* **A294** (1990) 251.

3. Study of the Giant Resonance in ^{12}C via the (e,e'n) Coincidence Experiment (II), K. Takahisa, T. Saito, S. Suzuki, T. Tohei, T. Nakagawa, Y. Kobayashi and K. Abe, *Resarch Rep. Laboratory of Nuclear Science* **22** (1989) 1.

4. The Study of the Giant Resonance in ^{40}Ca(e,e'n) Reaction (I), C. Takakuwa, T. Saito, S. Suzuki, K. Takahisa, T. Tohei, T. Nakagawa and K. Abe, *Resarch Rep. Laboratory of Nuclear Science* **23** (1990) 172.

Doctor Thesis (March 1991)

D1) **Study of the Hyperfine Structure of ^{87}SrII by Ion Trap and Laser Spectroscopy**, *Michiharu Wada*